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**PATENT ABSTRACTS OF JAPAN vol. 10, no. 265 (M-515)(2321) 10 September 1986 & JP-A-61088956**

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**EP 0 489 453 B1**

## Description

The present invention relates to a disc brake for use in a motor vehicle, and in particular to a brake caliper housing.

It is known in motor vehicles to provide a disc brake assembly which comprises a rotor, inner and outer brake pads, and a caliper housing having a cylindrical recess containing a piston for urging the inner brake pad into braking engagement with one side of the rotor and an arm member for urging the outer brake pad into braking engagement with the other side of the rotor by reactive force on actuation of the piston. The brake assembly includes a bridge coupling the caliper housing to the arm member. The bridge usually comprises two limbs which are substantially identical and symmetrical, and which in use apply the urging force, through the arm member, to the outer brake pad to cause it to come into braking engagement with the rotor. This type of disc brake assembly is commonly referred to as the floating caliper type.

In use, it has been found that such an arrangement causes uneven wear of the lining on the brake pad between its leading and trailing sides. This in turn can lead to sticking of the brake pad, and vibration which generates brake squeal or noise.

A prior art disc brake caliper is disclosed in EP-A-405,778.

JP-A-61-88,956 discloses a disc brake caliper formed from a composite aluminium casting which is strengthened by a cast iron insert embedded in each portion of the bridge of the caliper, thereby to strengthen the stress-concentrating part of the caliper.

DE-A-29 50 660 discloses a brake caliper in which the caliper bridge is formed from a material having a high modulus of elasticity and is wholly or partly encased by a material of lower density and a lower modulus of elasticity.

The present invention seeks to provide an improved disc brake.

According to an aspect of the present invention, there is provided a disc brake for a motor vehicle comprising a rotor; inner and outer brake pads disposed on opposite sides of the rotor and movable into braking engagement therewith; a piston for urging the inner brake pad against the rotor; and a caliper housing comprising a body member having a cylinder positioned on one side of the rotor and containing the piston, an arm member positioned on the other side of the rotor and cooperating with the outer brake pad, and a bridge extending between the body member and the arm member across the plane of the rotor, the bridge comprising a plurality of bridge portions each being connected at a first longitudinal extent thereof to

the body member and at a second longitudinal extent thereof to the second member; characterised by stiffening means operative on one or more of the bridge portions so as to cause the rigidity of the bridge to be stiffer at a leading side of the arm member than at a trailing side thereof. The manner in which the outer brake pad is urged onto the rotor can thereby be altered to prevent or reduce uneven wear thereof.

By 'leading side' of the arm member is meant the side of the arm member which is located upstream with respect to the normal direction of rotation of the rotor (that is the direction in which the rotor rotates when the vehicle is travelling in the forward direction). By 'trailing side' of the arm member is meant the side of the arm member located downstream with respect to the normal direction of rotation of the rotor.

The invention can be used with disc brakes of the fixed, floating and sliding types.

The invention also extends to a disc brake caliper.

Advantageously, the stiffening means is embedded in one or more of the bridge portions. In a preferred embodiment, the stiffening means comprises stiffening fibres. The stiffening fibres may extend into the arm member and/or the body member.

The stiffening fibres may be made of ceramics or carbon, or of any other suitable material. The caliper housing may be made of steel, aluminium or any other suitable material.

An embodiment of the present invention is described below, by way of illustration only, with reference to the accompanying drawing, in which:

Figure 1 is a side elevational view of an embodiment of disc brake assembly and brake caliper housing; and

Figure 2 is a plan view of the brake caliper housing of Figure 1.

Referring to Figure 1, the disc brake assembly 10 comprises a brake caliper housing 11 formed of a body member 12, an arm member 14, and a bridge 16 connected at one end to the body member 12 and at the other end to the arm member 14. The body member 12 has a generally cylindrical recess 13 therein which slideably receives a piston 15 to which is pressed an inner brake pad 17. The inner face 20 of the arm member 14 supports an outer brake pad 19 which faces the inner brake pad 17. A brake rotor 21, connected to a wheel (not shown) of a vehicle, lies between the inner and outer brake pads 17,19.

Hydraulic, or other, actuation of the piston 15 causes the inner brake pad 17 to be urged against one side of the rotor 21 and, by reactive force, causes the caliper housing 11 to float, thereby bringing the outer brake pad 19 into engagement

with the other side of the rotor 21, as is well known in the art.

The bridge 16 comprises first and second bridge portions 22, 24 (better seen in Figure 2) which extend along the longitudinal direction of the bridge 16, and are each connected at a first longitudinal extent to the body member 12 and at a second longitudinal extent to the arm member 14. The two bridge portions 22,24 are also connected to one another at either end.

A plurality of stiffening fibres 28, 30 are embedded within the caliper housing 11 and extend from within the body member 12, along the bridge 16 into the arm member 14.

As can be seen better in Figure 2, there are two different sets of fibres, each embedded in a respective bridge portion 22, 24 of the bridge 16. The first set 22 of stiffening fibres is located in the leading side of the caliper housing 11, relative to the direction in which the rotor 21 rotates when the vehicle is travelling forwardly (and shown by the arrow). The second set of stiffening fibres are located in the trailing side of the caliper housing 11.

There is a greater number and density of fibres in the first set of fibres 22 than in the second set 24 to cause the leading side of the caliper housing 11 to be stiffer than the trailing side. It has been found that this reduces uneven wear of the brake pads and, as a consequence, reduces brake noise and wear.

Other arrangements of fibres may be provided to give the same effect, for example, there may be fibres in only the first bridge portion 22, or there may be different types of fibres in the first and second bridge portions 22, 24. Alternatively, the fibres in the first bridge portion 22 may be thicker than the fibres in the second bridge portion.

The fibres may be pre-stressed to increase the overall rigidity of the bridge 16 and of the connection between the bridge and the two members 12, 14. Selective pre-stressing of the fibres can be used to increase the rigidity of the leading side of the bridge relative to the trailing side.

The fibres are conveniently embedded in the caliper housing 11 by placing them in the caliper housing mould prior to casting.

#### Claims

1. A disc brake for a motor vehicle comprising a rotor (21); inner and outer brake pads (17,19) disposed on opposite sides of the rotor and movable into braking engagement therewith; a piston (15) for urging the inner brake pad (17) against the rotor; and a caliper housing (11) comprising a body member (12) having a cylinder (13) positioned on one side of the rotor and containing the piston, an arm member (14)

positioned on the other side of the rotor and cooperating with the outer brake pad (19), and a bridge (16) extending between the body member and the arm member across the plane of the rotor, the bridge comprising a plurality of bridge portions (22,24) each being connected at a first longitudinal extent thereof to the body member and at a second longitudinal extent thereof to the arm member; characterised by stiffening fibres (28) in the arm member and one or more of the bridge portions causing the bridge to be stiffer at a leading side of the arm member than at a trailing side thereof.

2. A disc brake according to claim 1, wherein the stiffening fibres (28) extend into the body member.
3. A disc brake according to claim 1 or 2, wherein the stiffening fibres (28) are made of ceramics or carbon.
4. A disc brake according to any one of claims 1 to 3, wherein the stiffening fibres (28) are pre-stressed.
5. A disc brake according to any one of claims 1 to 4, wherein each bridge portion (22,24) comprises stiffening fibres (28), different densities of fibres being provided in each bridge portion.
6. A disc brake according to any one of claims 1 to 4, wherein each bridge portion (22,28) comprises stiffening fibres (28), the cross-sectional areas of the fibres differing from bridge portion to bridge portion.
7. A disc brake according to any preceding claim, wherein the bridge (11) comprises two bridge portions (22,24).
8. A disc brake according to claim 7, wherein the bridge portions (22,24) are separated from one another for at least part of the longitudinal extent of the bridge.

#### Patentansprüche

1. Scheibenbremse für ein Motorfahrzeug, die umfaßt einen Rotor (21); innere und äußere Brems pads (17, 19), die an gegenüberliegenden Seiten des Rotors angeordnet sind und mit diesem in Bremsengriff bewegbar sind; einen Kolben (15), um den inneren Brems pad (17) gegen den Rotor zu drücken; und ein Sattelgehäuse (11), das umfaßt ein Körperglied (12) mit einem Zylinder (13), der sich auf einer

Seite des Rotors befindet und den Kolben enthält, ein Armglied (14), das sich auf der anderen Seite des Rotors befindet und mit dem äußeren Bremspad (19) zusammenarbeitet und eine Brücke (16), die sich zwischen dem Körperglied und dem Armglied über die Ebene des Rotors erstreckt, wobei die Brücke eine Vielzahl von Brückenteilen (22, 24) umfaßt, von denen jedes an einer ersten Längserstreckung davon mit dem Körperglied verbunden ist und an einer zweiten Längserstreckung davon mit dem Armglied verbunden ist,

#### gekennzeichnet durch

Versteifungsfasern (28) in dem Armglied und einem oder mehreren der Brückenteile, die bewirken, daß die Brücke an einer vorderen Seite des Armglieds steifer als an einer hinteren Seite davon ist.

2. Scheibenbremse nach Anspruch 1, in der die Versteifungsfasern (28) sich in das Körperteil erstrecken.
3. Scheibenbremse nach Anspruch 1 oder 2, in der die Versteifungsfasern (28) aus Keramiken oder Kohlenstoff hergestellt sind.
4. Scheibenbremse nach einem der Ansprüche 1 bis 3, in der die Versteifungsfasern (28) vorgespannt sind.
5. Scheibenbremse nach einem der Ansprüche 1 bis 4, in der jedes Brückenteil (22, 24) Versteifungsfasern (28) umfaßt, wobei verschiedene Faserdichten in jedem Brückenteil vorgesehen sind.
6. Scheibenbremse nach einem der Ansprüche 1 bis 4, in der jedes Brückenteil (22, 24) Versteifungsfasern (28) umfaßt, wobei sich die Querschnittsbereiche der Fasern von Brückenteil zu Brückenteil unterscheiden.
7. Scheibenbremse nach einem der vorhergehenden Ansprüche, in der die Brücke (11) zwei Brückenteile (22, 24) umfaßt.
8. Scheibenbremse nach Anspruch 7, in der die Brückenteile (22, 24) über wenigstens einen Teil der Längserstreckung der Brücke voneinander beabstandet sind.

#### Revendications

1. Frein à disque pour un véhicule à moteur comportant un rotor (21), des plaquettes de disque intérieure et extérieure (17, 19) disposées de part et d'autre du rotor et pouvant être

déplacées pour être mises en prise de freinage avec celui-ci ; un piston (15) servant à pousser la plaquette de frein intérieure (17) contre le rotor ; et un carter d'étrier (11) comportant un élément faisant corps (12) ayant un cylindre (13) positionné d'un côté du rotor et contenant le piston, un élément formant bras (14) positionné de l'autre côté du rotor et qui coopère avec la plaquette de frein extérieure (19) et un pont (16) qui s'étend entre l'élément formant corps et l'élément formant bras à travers le plan du rotor, le pont comprenant une pluralité de portions de pont (22, 24) reliée chacune au niveau d'un premier prolongement longitudinal à l'élément formant corps et au niveau d'un deuxième prolongement longitudinal du pont à l'élément formant bras ; caractérisé par des fibres de raidissement (28) dans l'élément formant bras et dans une ou plusieurs portions du pont permettant de rendre celui-ci plus rigide du côté menant de l'élément formant bras que du côté arrière de celui-ci.

2. Frein à disque selon la revendication 1, dans lequel les fibres de raidissement (28) s'étendent à l'intérieur de l'élément formant corps.
3. Frein à disque selon les revendications 1 ou 2, dans lequel les fibres de raidissement (28) comprennent par des céramiques ou du carbone.
4. Frein à disque selon l'une quelconque des revendications 1 à 3, dans lequel les fibres de raidissement (28) sont précontraintes.
5. Frein à disque selon l'une quelconque des revendications 1 à 4, dans lequel chaque portion de pont (22, 24) comporte des fibres de raidissement (28), des fibres de densités différentes étant prévues dans chacune des portions du pont.
6. Frein à disque selon l'une quelconque des revendications 1 à 4, dans lequel chaque portion de pont (22, 24) comporte des fibres de raidissement (28) dont la surface de la section droite diffère d'une portion de pont à une autre.
7. Frein à disque selon l'une quelconque des revendications précédentes, dans lequel le pont (11) comporte deux portions de pont (22, 24).
8. Frein à disque selon la revendication 7, dans lequel les portions de pont (22, 24) sont sépa-

rées l'une de l'autre sur au moins une partie du prolongement longitudinal du pont.

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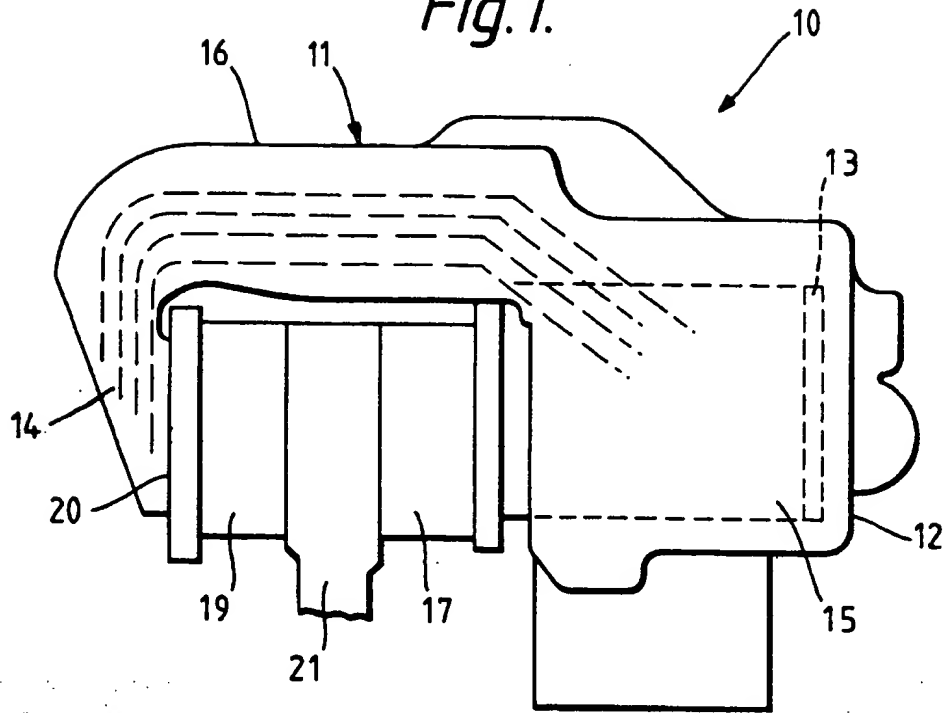
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*Fig. 1.*



*Fig. 2.*

